

Improving Quality of GNSS Vehicle Localization



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ITS&S – FP7 Easy OBU project

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Easy-OBU research project in a nutshell: GSA supported international project aimed at an introduction of cheap positioning solution with improved accuracy

What are we doing: we are developing and preparing market introduction of a new On-Board-Unit capable of providing more accurate location information in challenging situations (such as tunnels) at low cost

Who we are: an international consortium consisting of Efcon (AT), PWP Systems (DE), Austriatech (AT), ITS&S Association (CZ) and ČVUT (CZ)

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European Commission



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Short term signal loss is a major challenge for GNSS applications

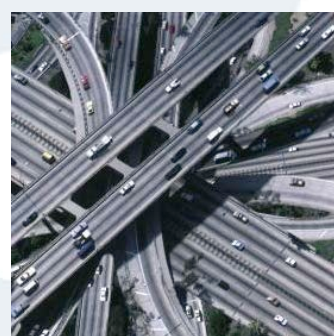
GNSS systems are currently unable to cope with loss-of-signal situations that are all but uncommon. When signal is lost, the location information becomes unavailable or very imprecise. Even with introduction of Galileo and other new systems, this problem is here to stay.



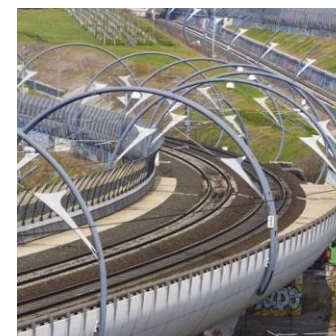
Urban Canyons



Tunnels



Junctions with underpasses



Railways

Solutions for localization precision improvement are available, but at a commercially unviable price point of tens of thousands of Euros per vehicle.

Easy-OBU will apply new technologies and scientific methods to radically cut the cost of the localization information improvement

User focused design and ...

- one simple OBU that does not need anything but a power cord to connect with the car
- standard location information (GPS and EGNOS) when GPS is available
- improved location information for loss-of-signal situations when GPS is unavailable

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... the technology behind

- motion sensors integrated into the OBU (gyroscope, accelerometer)
- Application of non-causal filtering that delivers great location information improvement even in combination with low-cost sensors
- Open interfaces for integration

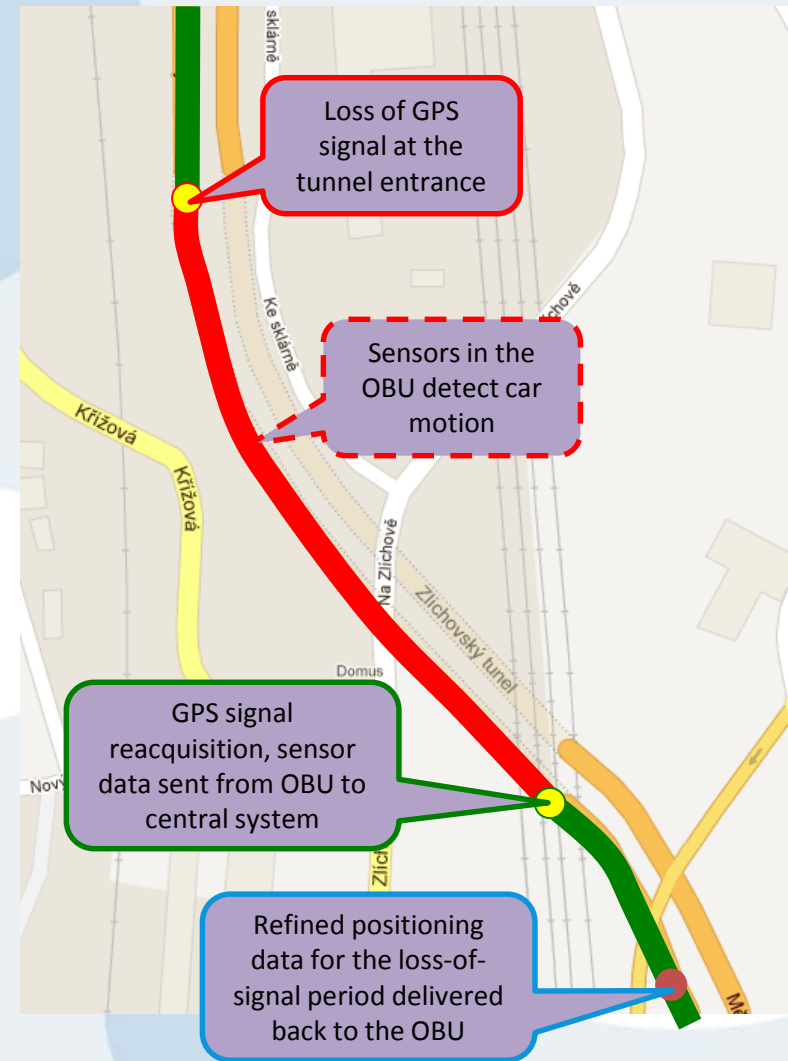
Simple, cost effective and commercially attractive solution for location information improvement able to compensate 95% of signal outages and ready for integration into various ecosystems

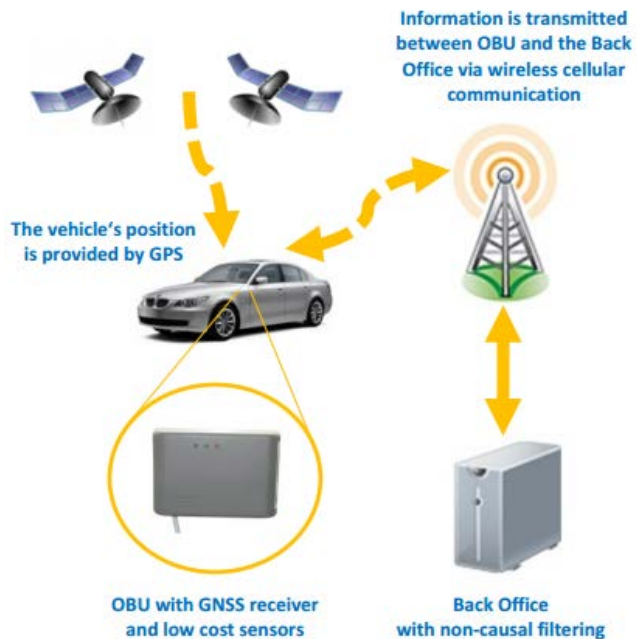
Easy-OBU can offer location precision improvement to applications that do not insist on real time availability of the location information

The only limitation of Easy-OBU (and a “price” paid for the low cost of the unit) is availability of the refined positioning data only after a short delay.

Easy-OBU is suitable only for applications that do not necessarily require the improved location information in real time:

- Shortly after leaving the tunnel, but not during the signal loss in the tunnel
- Examples of such applications may include:
 - Fee collection (tolling, parking etc.)
 - Car Sharing pay-per-use models
 - Route controlling (e.g. hazardous goods transport monitoring)
 - Fleet monitoring with analytics that requires a more precise location information
 - Insurance





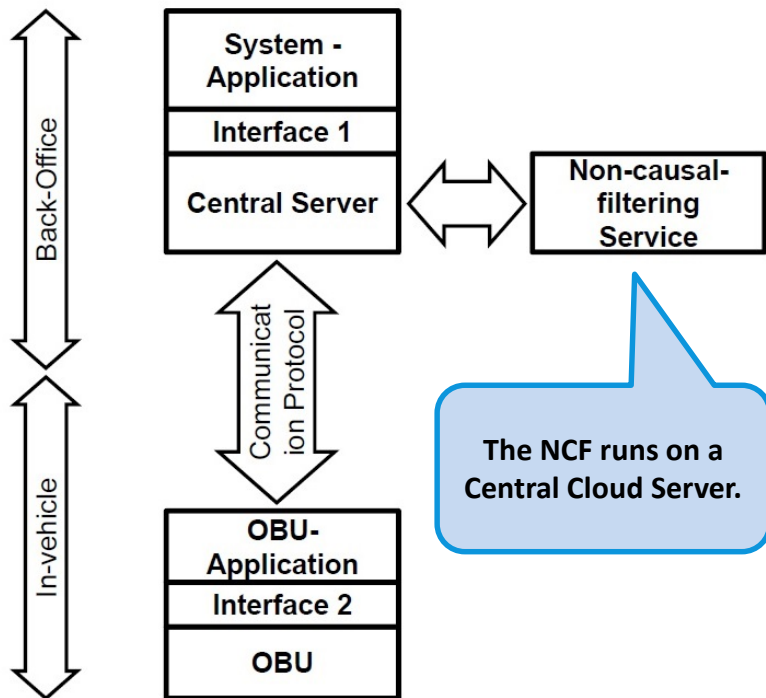
Major impact of Easy-OBU is robust position estimation also in situation with GNSS outages due to the novel filtering approach.

Basic components of Easy-OBU system:

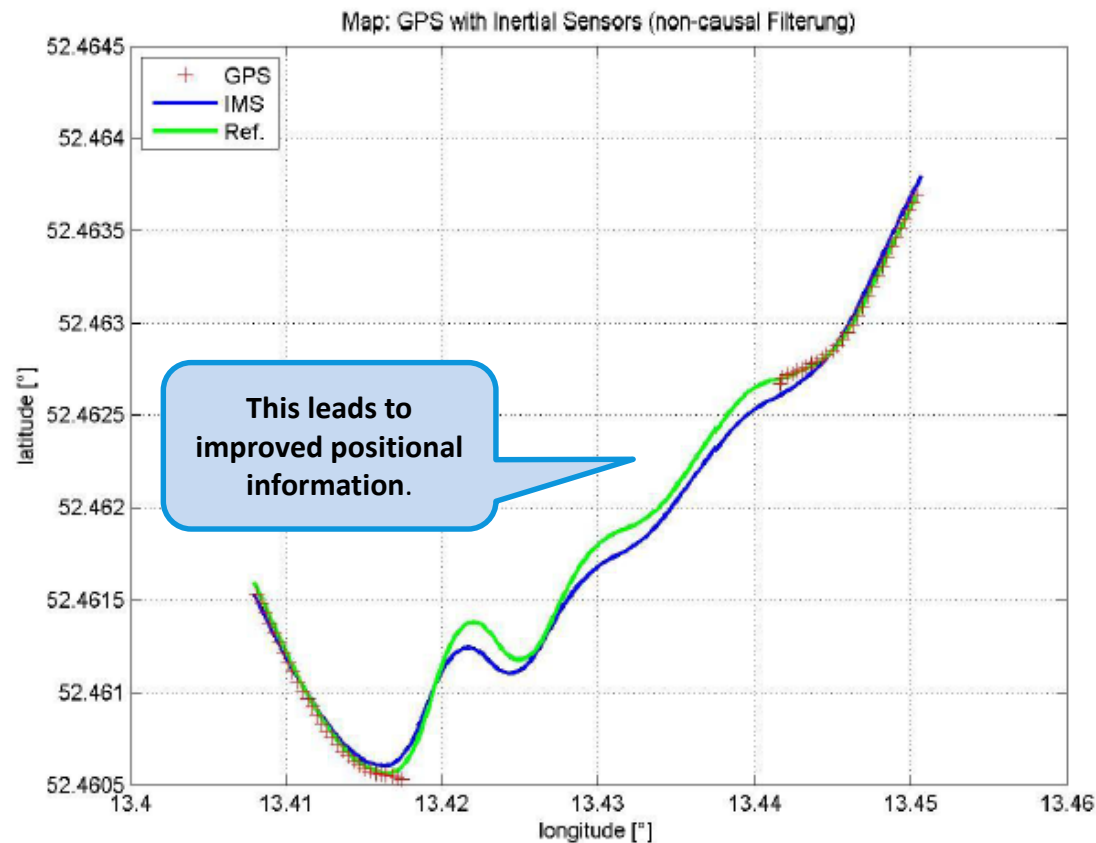
- ✓ On Board Unit
- ✓ Central Server
- ✓ Non-Causal Filtering

The System Architecture enables the most economic solution.

- the non-causal filter algorithms shall be located in **the central server**
- OBU contains **cheap internal sensors – gyroscope and accelerometer**
- the Easy-OBU system provides **two open interfaces**: Interface 1 and Interface 2
 - Interface 1 - development of different applications based on the available data in the back-office.
 - Interface 2 - the design and development of different OBU types according to the requirements of the different use cases.



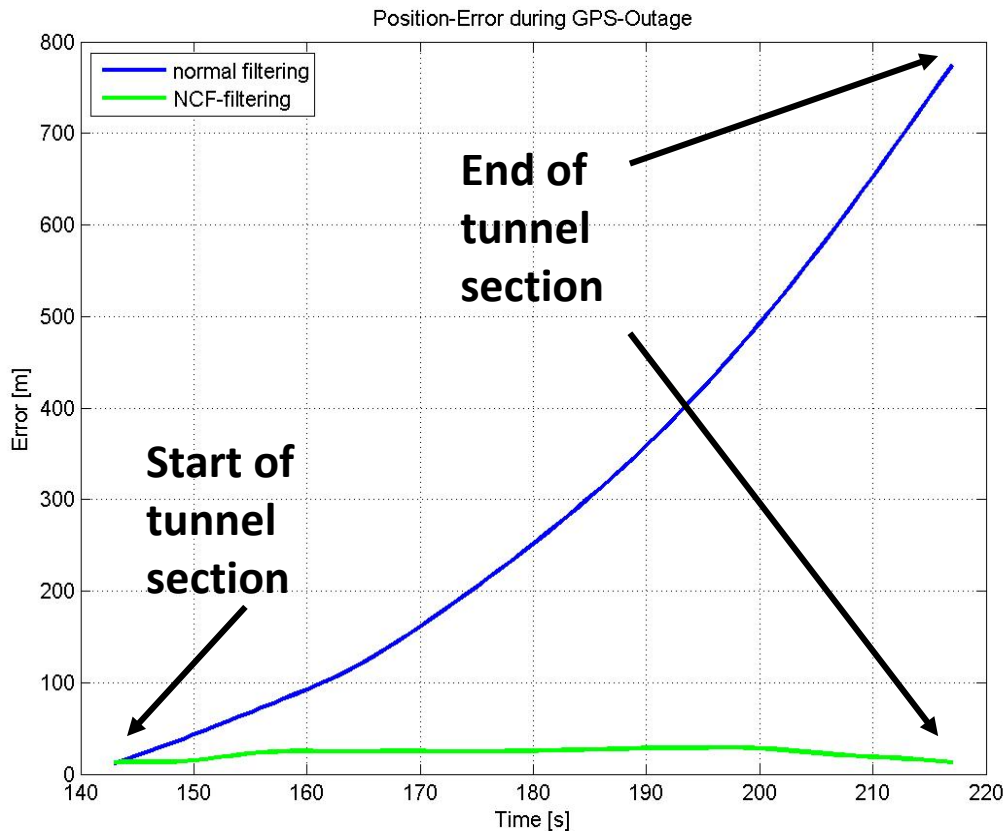
The innovative **NON-CAUSAL FILTERING** approach will cover GNSS outage and provide the necessary data.



The non-causal filtering...

- ... has the capability to work **without costly side effects**
- ... needs „**less real time**“ capability (retrospective robustness)
- ... bridges the times of GNSS outages with **1 Hz update** rate, but with a short time delay
- ... is based on **using low-cost sensors**

Tunnel sections are the most common examples of GNSS outages.



Thanks to the NCF algorithm the error is **NOT** rising with extending the gap of time outage.

- ✓ the gap has been bridged with **much smaller position-error**
- ✓ the maximum error of NCF stays **below 30 meters**, which states a **reduction of over 95%** of the error reached by classical filtering algorithms

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Thank you very much for your attention!

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